Experiment Design: Total Internal Reflection of Water

1 Goal

Design an experiment to observe total internal reflection of water in air and to measure the critical angle. Try to go beyond the obvious method and create ways you can achieve as high precision and accuracy as possible.

2 Hints

Pay attention to the fact that the ray of light usually goes through multiple refractions from the laser to when it comes out, so be sure you take in account all the deflections that result.

3 Equipment

- Laser Pointer
- Transparent beakers
- Dyed water
- Any other items of your choosing from the physics stockroom

4 Setup

Describe your setup in details, preferably with diagrams.

5 Procedure

Describe (step by step, not in one big paragraph) how you collect the data. Specifically what physical quantities do you measure, and how? How many trials are there?

6 Data

Typically you organize all your data in the form of a table. Design a table based on the data your are planning to measure.

7 Analysis

Is the answer what you expect theoretically? How do you calculate the theoretical value? What is the percentage error? What additional ideas can you learn from the experiment?

8 Experimental Errors

Describe any possible experimental errors.

9 Improvements

If you have more sophisticated equipment or more time, how would you improve the experiment? Justify your answer by explaining how your suggestion could improve the precision.